CONTENTS

JANUARY, 1939

Pure Physics Begets Applied Physics . . . 3
U. S. Naval Research Laboratory . . . ROSS GUNN 4
Resumés of Recent Research . . . 11
Nobel Prize Goes to Enrico Fermi . . . S. A. GOUDSMIT 14
Fine Grain Photographic Development . . . GEORGE HIGGINS 18
Letter to the Editor . . . WM. VAIDYA 26
Resonance Curve Method for the Absolute Measurement of Impedance at Frequencies of the Order 300 mc/Second . . . R. A. CHIPMAN 27
On the Resonant Frequency of Closed Concentric Lines . . . W. W. HANSEN 38
Studies in Lubrication. III. The Theory of the Thick Film Lubrication of a Complete Journal Bearing of Finite Length with Arbitrary Positions of the Lubricant Source . . . M. MUSKAT AND F. MORGAN 46
Structural Characteristics of Certain Silver Films . . . SANFORD F. ESSIG 61
Electrical and Luminescent Properties of Phosphors Under Electron Bombardment . . . WAYNE B. NOTTINGHAM 73
X-Ray Study of Menthol . . . S. S. SIDHU 83

Here and There . . . 16
Among Our Authors . . . 17
Innovations in Instruments . . . vi

FEBRUARY, 1939

Question Before Intelligent Individuals . . . 85
Cultural Values of Physics . . . DAVID DIETZ 86
Experimental Electronic Violin . . . L. H. STAUFFER 96
Resumés of Recent Research . . . 101
Double Refraction and Change in Length of Certain Plastics . . . H. W. FARWELL 109
Viscosity of Pennsylvania Oils at High Pressure . . . R. M. DIBERT, R. B. DOW AND C. E. FINK 113
Light Output and Secondary Emission Characteristics of Luminescent Materials . . . S. T. MARTIN AND L. B. HEADRICK 116
Nerve Conduction with Distributed Capacitance . . . ALVIN M. WEINBERG 128
Problem of Ice Formation . . . C. L. PEKERIS AND L. B. SLICHTER 135
Synthesis of a High Frequency Reactance . . . SIMON RAMO 138
Letters to the Editor:
High Frequency Amplifier and Oscillator . . . RUSSELL H. VARIAN AND SIGURD F. VARIAN 140
Simplified Calculation of the Arbitrary Constants of a Linear Differential Equation of the Second Order with Constant Coefficients . . . R. FEINBERG 140

New Books . . . 104
Among Our Authors . . . 106
Here and There . . . 107
Recent Booklets on Instruments and Materials . . . ii
Innovations in Instruments . . . viii

MARCH, 1939

Egg or the Chick . . . 141
Electrical Discharges in Air at Atmospheric Pressure. The Nature of the Positive and Negative Point-to-Plane Coronas and the Mechanism of Spark Propagation . . . LEONARD B. LOEB AND ARTHUR F. KIP 142
Physics of Rubber. I. Its Observed Elastic and Thermoelastic Behavior . . . EUGENE GUTH 161
Operational Calculus. I . . . LOUIS A. PIPES 172
Resumés of Recent Research . . . 181
Temperature Symposium . . . 184
On Resonators Suitable for Klystron Oscillators . . . W. W. HANSEN AND R. D. RICHTMYER 189
Note on the Quantitative Spectrographic Analysis of Small Amounts of Rubidium and Potassium in Biological Materials . . . WILLI M. COHN 200
Measurement of Some Arc Characteristics at 1000 Atmospheres Pressure . . . C. G. SUITS 203

New Books . . . 186
Contributors to This Issue . . . 187
Here and There . . . 188
Recent Booklets on Instruments and Materials . . . x

APRIL, 1939

Deeper Understanding Needed . . . 207
Survey of Crystal Optics. With Emphasis on the Parts Finding Application in Photoelasticity . . . JOSEPH VALASEK 209
Review of the Photoelastic Method of Stress Analysis. I . . . RAYMOND D. MINDLIN 222
Direct Optical Measurement of Individual Principal Stresses . . . J. H. A. BRAHTZ AND J. E. SOEHRENS 242
Isopachic Stress Patterns . . . MAX M. FROCHT 248
Operational Calculus. II. . . . LOUIS A. PIPES 258
Resumés of Recent Research . . . 265
Letter to the Editor:
New Method for Photoelasticity in Three Dimensions . . . R. WELLER 266
Here and There . . . 267
New Books . . . 269
Contributors to This Issue . . . 270
Innovations in Instruments . . . viii
Recent Booklets on Instruments and Materials . . . xii

MAY, 1939

New Frontiers for Industry . . . CARL BREER 271
Review of the Photoelastic Method of Stress Analysis. II . . . RAYMOND D. MINDLIN 273
Application of Hardening Resins in Three-Dimensional Photoelastic Studies . . . M. HETÉNYI 295
Operational Calculus. III . . . LOUIS A. PIPES 301
Resumés of Recent Research . . . 313
High Frequency Oscillator and Amplifier . . . RUSSELL H. VARIAN AND SIGURD F. VARIAN 321
Studies in Lubrication. IV. The Experimental Variation of the Coefficient of Friction with the Strength of the Lubricant Source for a Complete Journal Bearing . . . F. MORGAN AND M. MUSKAT 327
Luminescence During Intermittent Electron Bombardment . . . R. B. NELSON, R. P. JOHNSON AND W. B. NOTTINGHAM 335

New Books . . . 315
Here and There . . . 317
Contributors to This Issue . . . 320

JUNE, 1939

That Publication Problem, Again! . . . 343
Physics of Flames and Explosions of Gases . . . BERNARD LEWIS AND GUENTHER VON ELBE 344
Recreating Geological History with Models. The Expermiental Study of the Earth's Crustal Deformations . . . MILTON B. DOBRIN 360
Resumés of Recent Research . . . 372
New Million-Volt X-Ray Outfit . . . E. E. CHARLTON, W. F. WESTENDORP, L. E. DEMPSTER AND GEORGE HOTALING 374
Letter to the Editor:
Centrifugal Stresses in Rotating Disks . . . R. E. NEWTON 389
Dielectric Resonators . . . R. D. RICHTMYER 391
Studies in Lubrication. V. The Theory of the Thick Film Lubrication of Flooded Journal Bearings and Bearings with Circumferential Grooves . . . M. MUSKAT AND F. MORGAN 398
Phosphorescence of Zinc Silicate Phosphors . . . GORTON R. FONDA 408
Reignition of Short Arcs at High Pressures . . . J. D. COBINE, R. B. POWER AND L. P. WINSOR 420

Here and There . . . 386
Contributors to This Issue . . . 388
New Books . . . 390
Innovations in Instruments . . . x

JULY, 1939

Television, a Task Well Begun . . . 425
Probable Influences of Television on Society . . . DAVID SARNOFF 426
Survey of Television Pick-Up Devices . . . KNOX MCILWAIN 432
High Definition Television . . . PIERRE MERTZ 443
Problems of Television Transmission . . . PETER C. GOLDMARK 447
Television Receiving and Reproducing Systems . . . E. W. ENGSTROM 455
Electron Optics . . . E. G. RAMBERG AND G. A. MORTON 465
Luminescent Materials . . . HUMBOLDT W. LEVERENZ AND FREDERICK SEITZ 479
Resumés of Recent Research . . . 494
Cathode-Ray Bunching . . . DAVID L. WEBSTER 501
Ionic Mobility in Solid Dielectrics . . . ANDREW GEMANT 508
Dielectric Strength of Benzene and Heptane . . . RALPH W. DORNTE 514
Electron Diffraction Study of Copper Oxides . . . H. DUNHOLTER AND H. KERSTEN 523

Contributors to This Issue . . . 496
New Books . . . 497
Here and There . . . 498
Innovations in Instruments . . . viii

AUGUST, 1939

Shall We Kill the Goose that Lays the Golden Eggs? 525
Sound Measurements in Industry . . . . . ERNEST J. ABBOTT 526
Resumés of Recent Research 532
Applied Physics in the Bureau of Home Economics . . . . . MARGARET B. HAYS 537
Nature of the Metallic State . . . . . WILLIAM SHOCKLEY 543
Accessories for Spectrochemical Analysis . . . . . STANLEY S. BALLARD AND PAUL L. GOW 556
X-Ray Investigation of Crystallinity in Rubber . . . . . S. D. GEHMAN AND J. E. FIELD 564
Effects of Irradiation, Humidity and Sphere Material on the Sparkover Voltage of the Two-Centimeter Sphere Gap . . . . . ARTHUR B. LEWIS 573
Thermal Distribution and Temperature Gradient in the Arc Welding of Oil Well Casing . . . . . W. A. BRUCE 578
Convection and Conduction of Heat in Gases . . . . . I. BRODY AND F. KŐRÖSY 584

Here and There 558
New Books 559
Contributors to This Issue 562
Innovations in Instruments 563

SEPTEMBER, 1939

Research—A National Resource 597
Economic Features of X-Ray Protection . . . . . LAURISTON S. TAYLOR 598
Radium Protection . . . . . EDITH H. QUIMBY 604
Resumés of Recent Research 609
Uranium and Atomic Power . . . . . R. B. ROBERTS AND J. B. H. KUPER 612
Advisory Council on Applied Physics. Report of Meeting, Pittsburgh, March 25, 1939 615
Bactericidal Effects of Ultraviolet Radiation Produced by Low Pressure Mercury Vapor Lamps . . . . . L. R. KOLLER 624
Energy Measurements of Reigniting A.C. Arcs . . . . . S. G. ESKIN 631
Beam Tubes as Ultra-High Frequency Generators . . . . . RONOLD KING 638
Some Properties of the Hydrogen Arc . . . . . C. G. SUITS 648
Rate of Plastic Deformation in Lead Under Compression . . . . . W. JAMES LYONS 651
Lack of "Sucking" Action by the Cathode Blast of Mercury Vapor in a Pool Rectifier . . . . . LEWI TONKS 654
Photographs of Unusual Discharges Occurring During Thunderstorms . . . . . R. E. HOLZER AND E. J. WORKMAN 659
Electrostatic Field Produced by a Point Charge in the Axis of a Cylinder . . . ERNST WEBER 663

Contributors to This Issue 621
New Books 622
Here and There 623
Innovations in Instruments vi

OCTOBER, 1939

"The World of Creative Physics" 667
Properties of Oxide-Coated Cathodes. I . . . . . JOHN P. BLEWETT 668
Filtration of Sound. II . . . . . R. B. LINDSAY 680
Appeal for Fundamental Research . . . . . HERBERT HOOVER 688
Principles of Statistical Mechanics . . . . . E. U. CONDON 691
Temperature Symposium 693
Viscosity of Dilute Solutions of Long-Chain Molecules. III. The Staudinger Viscosity Law . . . . . MAURICE L. HUGGINS 700
Rhodium Mirrors for Scientific Purposes . . . . . M. AUWÄRTER 705
Motion of Cylindrical Particles in Viscous Flow . . . . . R. C. BINDER 711
Note on the Behavior of High Intensity Mercury Arcs Falling Freely Under Gravity . . . . . CARL KENTY 714
Limiting Current Densities in Electron Beams . . . . . J. R. PIERCE 715
Electrolytic Polishing . . . . . W. C. ELMORE 724
Temperature of High Pressure Arcs . . . . . C. G. SUITS 728
Current Densities, Lumen Efficiency and Brightness in A, N_2, He and H_2 Arcs . . C. G. SUITS 730

Here and There 696
New Books 697
Contributors to This Issue 699
Innovations in Instruments viii

NOVEMBER, 1939

Research and Preparedness 733
Spectroscopic Apparatus . . . . . WILLIAM F. MEGGERS 734
Qualitative and Quantitative Chemical Analysis by Line Emission Spectra . RALPH A. SAWYER 741
Absorption Spectra as Applied to Molecular Identification and Analysis . WALLACE R. BRODE 751
Compilations of Spectroscopic Data . . . . . GEORGE R. HARRISON 760
Infra-Red Spectra—Observation and Uses . . . . . H. M. RANDALL 768
Molecular Emission Spectra . . . . . G. H. DIEKE 780
Astronomical Spectra. Modern Observation and Interpretation . . . . . OTTO STRUVE 800

Contributors to This Issue 767
Here and There 817
New Books 817

DECEMBER, 1939

Symposium on Temperature 819
X-Ray Diffraction Applied to Chemical Analysis . . . . . WHEELER P. DAVEY 820
Properties of Oxide-Coated Cathodes. II . . . . . JOHN P. BLEWETT 831
Matrix Theory of Oscillatory Networks . . . . . LOUIS A. PIPES 849
Increase of Torsional Stiffness of a Prismatical Bar Due to Axial Tension . . . . M. A. BIOT 860
Theory of Klystron Oscillations . . . . . DAVID L. WEBSTER 864
Atomphysical Interpretation of Lichtenberg Figures and Their Application to the Study of Gas Discharge Phenomena . . . . . F. H. MERRILL AND A. VON HIPPEL 873
Note on the Elastic Properties of Vinyl Sheeting . . . . . S. BATESON 887
Piezoelectric *Versus* Mechanical Spring Pressure Gauge . . . . . R. ALDEN WEBSTER 890

Here and There 892
Contributors to This Issue 893
Author Index 894
Subject Index 897
Volume Table of Contents iii
Index to Advertisers x